

# *University of Bahrain*

*College of Information Technology*

*Department of Computer Science*

*ITCS252 Discrete Structure I*

*Second Semester 2013/2014*

*Exam #1 — One Hour*

NAME	
ID #	
SECTION #	
SERIAL	

Time: 2:00 – 3:00 PM

This exam contains **4** pages (including this cover page) and **4** questions. Check to see if any pages are missing. Enter all requested information.

**You are not allowed to use books, notes, or mobiles**

Question	Points	Score
1	8	
2	8	
3	8	
4	10	
Total:	34	

(1) [8 points] Let

$t$ : "The cat chases the mouse"

$c$ : "The cat catches the mouse"

$r$ : "The mouse run away from the cat"

$h$ : "The mouse hide from the cat"

Answer the following questions.

(a) Give the statement  $c \longrightarrow \neg h \vee r$  in English using *unless*.

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(b) Give the inverse in symbolic form for the statement:

*A necessary condition for the mouse to run away from the cat and hide is the cat does not catch the mouse.*

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(c) Give the converse in English for the following statement.

$t \wedge \neg c \longrightarrow \neg h$

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(d) Give the negation in symbolic form for the following statement using only  $\wedge$ ,  $\vee$ , and  $\neg$ .

*If the mouse neither run away nor hide, then the cat either will chase the mouse or catch it.*

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(2) [8 points] What is the truth value of the following statements. Give reasons to your answer.

(a) ☐ True      ☐ False

$\exists x \in \mathbf{Z}, \forall y \in \mathbb{Z}^+ : xy < 0$

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(b) ☐ True      ☐ False

$\forall x \in \mathbf{Z}, \exists y \in \mathbb{Z}^+ : xy < 0$

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(c) ☐ True      ☐ False

$$\forall y \in \mathbf{R}, \exists x \in \mathbf{R} : y = 2x + 1$$

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(d) ☐ True      ☐ False

$$\exists x \in \mathbf{R}, \exists y \in \mathbf{R} : (x - y = -1) \wedge (2x + y = 1)$$

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**(3) [8 points]** Let  $T(x, y) : “x \text{ bites } y”$ .  $B(x)$  “ $x$  is black ” and  $F(x)$  “ $x$  is furry” . Assume the domain of  $x$  and  $y$  are all cats  $C$ .

Answer the following.

(a) Give the symbolic form for

*Some black cats bite the cat **Fify***

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(b) Give the symbolic form for

*All black cats bites some furry cats.*

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(c) Write the following statement in English

$$\exists y \forall x : \neg B(x) \longrightarrow T(x, y)$$

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(d) Write the negation of the following statement in English

$$\forall x \exists y : T(x, y) \wedge F(y)$$

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(4) Consider the following argument:

*If my golden ring is on the table, then it is neither beside the bathroom mirror nor in the jewellery box. My golden ring is not in my finger and it is not in my bag. If I did not lose my golden ring, then it is in my bag. My golden ring is in my finger or in the jewellery box. Therefore, my golden ring is not on the table and I lost it.*

(a) **[3 points]** Convert the above argument into symbolic form

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(b) **[7 points]** Show the above argument is valid

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